

“Concept Development of a Biomimetically Adapted Manipulator for Underwater Applications”

Background

Manipulators are key components of underwater robots (ROVs, AUVs, crawlers) and enable gripping, assembly, and inspection tasks under extreme conditions. In fast-flowing or turbulent environments, conventional systems often reach their limits in terms of stability, mobility, and force transmission. Biomimetic approaches – inspired by fish fins, tentacles, or other flexible marine organisms – offer the potential to enhance range of motion, flexibility, and energy efficiency while reducing the effects of currents.

Objective of thesis

The objective of this thesis is the conceptual development of a biomimetically inspired manipulator optimized for underwater applications. The work includes analyzing relevant biomimetic principles, deriving requirements for underwater operation, and developing an initial technical system concept.

Tasks

Depending on the type of thesis (Bachelor, Project, Master), individual focus areas may vary. The thesis can be written in German or English. Core tasks include:

- Analysis of typical underwater manipulation tasks and loads caused by currents
- Investigation and evaluation of biomimetic models (fish fins, tentacles, gripping organs)
- Derivation of design principles to optimize flexibility, stability, and force transmission
- Development of a conceptual design for a biomimetically adapted manipulator
- Evaluation of hydrodynamics, mobility, and force transmission
- Optional: CAD modeling or simulation of motion sequences; feasibility assessment including opportunities, risks, and limitations

Your Profile

- Studies in Mechanical Engineering, Mechatronics, Robotics, Marine Technology, or a related field
- Independent and structured working style
- Experience in CAD, flow simulation, or kinematic modeling

We offer

- Work on a future-oriented topic in the field of marine robotics
- Close supervision by experts from research and industry
- Creative technical work in an exciting research environment
- Access to testing facilities and technical resources

Contact

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